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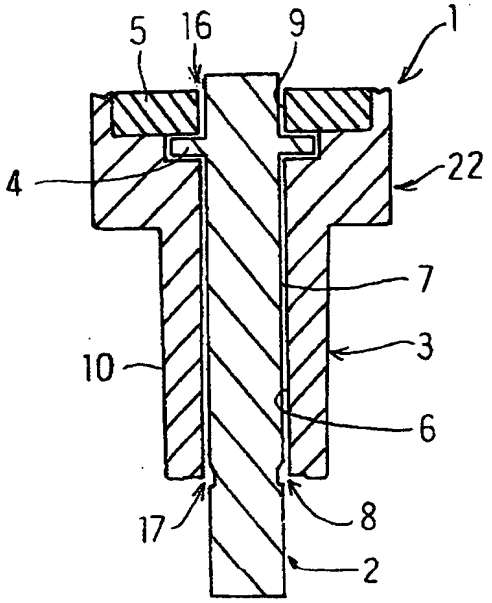
(54)【発明の名称】　軸受装置の流体潤滑剤注入方法

(57)【要約】　（修正有）
【目的】　軸受装置の小型化に対しても効率よく流体潤滑剤の注入ができ、簡単な方法で手間もとらず、確実に注入する。軸受装置の小型化に対しても効率よく流体潤滑剤の注入を行なうことができ、しかも簡単な方法で手間をとらず、確実に注入することができる、軸受装置の流体潤滑剤注入方法を提供する。
【構成】　オイルを介してシャフト２とスリーブ３とが相対回転支持される軸受装置１に対し、オイルを注入する注入方法である。シャフト２とスリーブ３との間にオイルが介在されうる対応部位を除いたシャフトとスリーブとの表面へ、オイル付着を防止する被覆部材を予め塗布し、次にシャフトとスリーブとをオイル中に浸漬して、シャフトとスリーブとの間にオイルを介在させ、更に被覆部材を除去する。



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【特許請求の範囲】

【請求項１】　流体潤滑剤を介してシャフトとスリーブとが相対回転支持される軸受装置に対し、前記流体潤滑剤を注入する注入方法であって、

前記シャフトと前記スリーブとの間に前記流体潤滑剤が介在されうる対応部位を除いた前記シャフトと前記スリーブとの表面へ、前記流体潤滑剤の付着を防止する被覆部材を予め塗布し、

次に前記シャフトと前記スリーブとを前記流体潤滑剤中に浸漬して、前記シャフトと前記スリーブとの間に該流体潤滑剤を介在させ、

更に前記被覆部材を除去するようにした、ことを特徴とする軸受装置の流体潤滑剤注入方法。

【請求項２】　前記被覆部材には可撓性材料が用いられた請求項１記載の流体潤滑剤注入方法。

【請求項３】　流体潤滑剤を介してシャフトとスリーブとが相対回転支持される軸受装置に対し、前記流体潤滑剤を注入する注入方法であって、

前記シャフトと前記スリーブとの間隙に連設された減圧手段とにより、前記流体潤滑剤が注入される、ことを特徴とする軸受装置の流体潤滑剤注入方法。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は、流体潤滑剤を用いた軸受装置について、その流体潤滑剤を注入するための注入方法に関する。

【０００２】

【従来の技術】シャフトと、このシャフトに外嵌されるスリーブとを備え、潤滑オイルを介して両者が相対回転支持される軸受装置として、例えば多孔質焼結合金によるスリーブ軸受や動圧発生溝を備えた動圧軸受等がある。これらの軸受装置では、シャフトとスリーブとの（軸受）間隙部に、潤滑用のオイルが介在して設けられるが、こうした軸受装置へオイルを注入する場合、シャフトとスリーブとの間隙部にオイルディスペンサを用いて注入する方法や、シャフトとスリーブの軸受装置ごとをオイル槽に浸漬してオイルを充填する方法等がある。

【０００３】

【発明が解決しようとする課題】オイルディスペンサを用いるオイル注入方法では、シャフトとスリーブとの（軸受）間隙寸法に対応してディスペンサの吐出開口が規定されるから、注入される軸受装置が小型化するにつれ、対応できる寸法に限界があると共に、オイル注入量が微量となりそのコントロールが困難となる。他方、シャフトとスリーブとの軸受装置ごとを、オイル槽に浸漬し、これにより（軸受）間隙内へオイルを注入する方法では、オイル槽自体を設備することが大がかりになる他、軸受装置における本来付着してほしくない部分にもオイルが付着し、このための除去に手間を要してきた。その際、予め、オイルを撥油する撥油剤を塗布することも可能であるが、その除去自体が煩雑であり、こうしたオイル注入に対して何等かの方策が望まれていた。

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【０００４】本発明は、従来技術に存した上記のような問題点に対して行われたものであって、その課題とするところは、軸受装置の小型化に対しても効率よく流体潤滑剤の注入を行なうことができ、しかも簡単な方法で手間をとらず、確実に注入することができる、軸受装置の流体潤滑剤注入方法を提供することにある。

【０００５】

【課題を解決するための手段】上記課題を達成するために、本発明は、流体潤滑剤を介してシャフトとスリーブとが相対回転支持される軸受装置に対し、前記流体潤滑剤を注入する注入方法であって；前記シャフトと前記スリーブとの間に前記流体潤滑剤が介在されうる対応部位を除いた前記シャフトと前記スリーブとの表面へ、前記流体潤滑剤の付着を防止する被覆部材を予め塗布し；次に前記シャフトと前記スリーブとを前記流体潤滑剤中に浸漬して、前記シャフトと前記スリーブとの間に該流体潤滑剤を介在させ；更に前記被覆部材を除去するようにした。

【０００６】また、前記被覆部材には可撓性材料が用いられることが望ましい。

【０００７】更に本発明によれば、流体潤滑剤を介してシャフトとスリーブとが相対回転支持される軸受装置に対し、前記流体潤滑剤を注入する注入方法であって；前記シャフトと前記スリーブとの間隙に連設された減圧手段とにより、前記流体潤滑剤が注入されるようにした。

【０００８】

【作用】本発明の軸受装置の流体潤滑剤注入方法によれば、シャフトとスリーブとの間に流体潤滑剤が介在されうる対応部位を除いたシャフトとスリーブとの表面へ、流体潤滑剤の付着を防止する被覆部材を予め塗布し、次に前記シャフトと前記スリーブとを前記流体潤滑剤中に浸漬して、前記シャフトと前記スリーブとの間に該流体潤滑剤を介在させ、更に前記被覆部材を除去するようにした。従って流体潤滑剤が付着してはいけない部位に被覆部材を塗布し、流体潤滑剤注入後はこれを除去するだけでよいので、流体潤滑剤注入作業が簡単となり、軸受装置の大きさに係わらず、しかも確実に注入することができる。

【０００９】また被覆部材には可撓性材料を用いることにより、塗布作業が容易であり、流体潤滑剤注入後の除去、即ち剥離作業がより一層簡単となり、作業効率の向上を図ることができる。

【００１０】更に本発明における別の軸受装置の流体潤滑剤注入方法によれば、シャフトとスリーブとの間隙に連設された減圧手段とにより、流体潤滑剤が注入されるようにした。これにより、流体潤滑剤の注入が容易であり、軸受装置の大きさに係わらず、しかも確実に注入することができる。

【００１１】
【実施例】本発明に従う軸受装置の流体潤滑剤注入方法の実施例について、以下の図面を参照して詳述する。図１に示す軸受装置は、例えば図５に示すスピンドルモータに組み込んで用いられる。軸受装置１は、シャフト２と、これに外嵌されるスリーブ３で構成される。シャフト２の上端部には、環状に張り出して設けられた鍔状のスラストプレート４が形成され、スラストプレート４を軸方向に挟むようにスラストカバー５が設けられている。シャフト２の外周部７とスリーブ３の内周部６とは、ラジアル（半径）方向へ微小間隙をもって対向配置され、またスラストプレート４を挟みスリーブ３とスラストカバー５とでスラスト（軸）方向へ微小間隙をもって対向配置されている。さらに、スラストカバー５の内周部９とシャフト２の外周部７とがラジアル方向へ微小間隙をもって対向配置されている。（スラストカバー５におけるラジアル方向への微小間隙を除き）これらラジアル、スラスト方向の微小間隙８には、流体潤滑剤が充填され、しかもそれぞれ対向する、いずれかの部材側には流体潤滑剤を介して動圧軸受支持する動圧発生溝が形成されている。
【００１２】なお、このような軸受装置１が組み込まれるスピンドルモータは、図５に示すように、シャフト１の下側端部がハウジング（又はブラケット）１１に嵌め込まれて固定される。シャフト１に回転支持されるスリーブ３はその上部外周にロータハブ１４が外嵌して固定される。また回転駆動部材であるステータ１２は、ハウジング１１のボス部に固定され、このステータ１２と半径方向へ対向するように、ロータマグネット１３がロータハブ１４側に配設されている。ロータマグネット１３は、ロータハブ内周部にロータヨーク１５を介して取り付けられている。従って、ステータ１２に所要の電気信号が通電されると、ステータ１２とロータマグネット１３との電磁相互作用により、ロータハブ１４が回転駆動される。
【００１３】軸受装置１は流体潤滑剤を介して軸受支持され、軸受装置１の性能の根幹となる流体潤滑剤、即ち軸受間隙８に介在される流体潤滑剤で例えばオイルを注入する手順について以下説明する。まず既に示した図１に軸受装置１においては、図１乃至図４を用いて説明する。図１に示すように、予め、シャフト２とスリーブ３とを嵌合させて組み、さらに、スラストカバーをスリーブ３に固定して軸受装置全体を形成しておく。次に図２に示すように、軸受間隙８の開口両端部１６、１７へ弾性リング（例えばＯ字状ゴムリング）１８、１９を装着して両開口１６、１７を閉塞する。即ち軸受装置１の軸受間隙８を外部と封止する。
【００１４】軸受間隙８が封止された軸受装置１は、図３に示すように、酢酸ビニルが溶融された溶融槽２０中に浸漬される。これにより、軸受装置１の表面部全域にわたり酢酸ビニルが付着する。なお、軸受間隙８には弾性リング１８、１９が装着されているため、酢酸ビニルが内部に侵入することはない。槽２０から引き上げられた軸受装置１は、弾性リング１８、１９が軸受間隙８から取り外され、次に示す図５の流体潤滑剤であるオイル貯留槽２１へ浸漬される。これによりオイルは軸受間隙８内部へ浸透して注入される。なお、軸受間隙８の間隙が微小なため、毛細管現象でオイルを内部へ浸透させると共に、オイル貯留槽２１全体を減圧して強制的にオイルを注入させることもできる。
【００１５】こうして軸受装置１の軸受間隙８にオイルが充填された後、軸受装置表面に付着した酢酸ビニルを剥して取り除く。これにより、軸受装置１の表面に付着したオイルは容易に取り除かれる。従って、この軸受装置１を図５に示すようなスピンドルモータに組み込まれる際、軸受装置の余分な部分にオイルが付着していないから、スピンドルモータ内部をオイルで汚染したり、組立固定部にオイルが侵入して取付不良を起こしたりすることが防止される。
【００１６】酢酸ビニルは軸受装置１に塗布することが容易であると共に、塗布後も剥離が容易で作業性の向上が図れる。上記実施例では、軸受装置１を酢酸ビニルの溶融槽２０へ浸漬したが、スプレー塗装にて被覆、コーティングしても可能である。なお、酢酸ビニルの他、例えば天然ゴムラテックスや塩化ビニル等可撓性材料を用いることも可能であり、皮膜強度や剥離性の点において、好ましい結果が得られる。そして、図例の軸受装置１は動圧軸受装置を用いているが、多孔質の焼結合金によるスリーブ軸受やその他の種々のオイルを介在した軸受装置に適用できる。また、図例の軸受装置はシャフト２とスリーブ３に加え、スラストカバー５やスラストプレート４が設けられた構成を示しているが、シャフトとスリーブとの構成、組み合わせであっても勿論構わない。さらに、軸受装置１の軸受間隙８を封止する弾性リング１８、１９に代えて、例えば、リング状の嵌合部材等も採用することができる。
【００１７】次に示す図６は別の軸受装置を示し図６の（ａ）はその側面図、（ｂ）は（ａ）の矢視ａ－ａにおける平面図、（ｃ）断面図である。図６の軸受装置３１はいずれもオイルを注入する為の注入台４３に載置されている状態を示している。軸受装置３１は、シャフト３２にスリーブ３３が外嵌され、そのスリーブ上下端（両端）部を挟むように、スラスト部材３５、３６がシャフト３２に固定されている。スラスト部材３５、３６は、スリーブ３２の両端部を軸方向へ微小間隙をもって対向配置されている。スリーブ３２の外側には、円筒状のケース３４が外装されている。シャフト３２の外周部とスリーブ３３の内周部とのラジアル方向微小間隙、そしてスリーブ３３とこれにスラスト方向へ対向配置されたスラスト部材３５、３６とによるスラスト方向微小間隙、

これら微小間隙により軸受間隙５０が生成され、流体潤滑剤であるオイルが充填、注入される。

【００１８】次に軸受装置３１にオイルを注入する手順について説明する。軸受装置３１が載置される注入台４３には、図６（ｂ）、（ｃ）に示すように、環状に配設され、且つ周方向へ多数の微小突起が交互に設けられたブローブ４４を有している。ブローブ４４は、軸受装置３１の下側スラスト部材３６に対応して付き合わされて設けられている。注入台４３におけるブローブ外周側には、オイルが貯留された溝部４７が設けられている。従って、軸受装置３１が注入台４３に載置されると、毛細管現象により、溝部４７のオイルがブローブ４４に浸透して軸受間隙５０へ注入される。この場合、軸受間隙５０で生成される表面張力によりオイルを保持しようとする内部保持力と、毛細管現象による浸透吸引力との均衡点に達するまで、軸受間隙５０内へオイルが注入される。なお、この場合、装置全体を減圧（器）装置に入れて、減圧雰囲気中で行なうと、オイル内に含有した残留気泡を除去することができるので、より好ましい。

【００１９】次に示す図７は、更に別のオイル注入の手順を説明するものであり、軸受装置には図６に示したものと、同じ部位には、同じ番号が付してある。図７においては、減圧装置を用いて軸受装置３１へオイルを注入するものであり、以下に説明する。本手順は減圧を利用する真空置換方式であり、注入台６０に載置された軸受装置３１は、オイルが注入される軸受間隙５０の下側開口６１を注入台６０のオイル取り入れ部に対応して配置されている。また軸受装置３１の上側は、クランプ部材５９で押圧されると共に、軸受間隙５０の上側開口を閉塞するように設けられている。

【００２０】注入台６０にはオイルが貯留された貯留槽５３が設けられ、供給通路５４、バルブ５６を経て軸受装置３１の下側開口６１に接続されている。（図の右側）また注入台６０には、別にバキュームポンプ５１がチャンバー５２、通気路５５、そしてバルブ５７を介して下側開口６１に接続されている。（図の左側）更に、注入台６０には、下側開口６１に連設してオイル排出槽５８が設けられている。

【００２１】次に図７の軸受装置３１にオイルを注入する手順を説明する。まずバルブ５６、５７を閉じた状態にしておき、軸受装置３１を注入台６０に載置する。その際、注入台６０の載置部位が、軸受装置３１の下側開口６１に対応して接続される。（なお、密封した接続が行なわれるよう、注入台６０の載置対応部には、弾性リング等の密封補助部材７１、７２が介装されている。そして図の上方からクランプ部材５９が下降して軸受装置３１を押圧する。これにて軸受装置３１のセットが完了する。

【００２２】軸受装置３１完了後、バルブ５７が開けられ、軸受間隙５０が減圧される。減圧の後、バルブ５７が閉じられる。次にバルブ５６が開けられ、オイルが貯留槽５３から供給路５４を経て軸受間隙５０へ引き込まれる。所定時間の後軸受間隙５０へオイルが充填注入された後、バルブ５６が閉じられる。これにてオイル注入が完了する。その後クランプ部材５９が上昇して取り外され、新たな軸受装置３１に交換される。オイル排出槽５８には、余分なオイルが貯えられバキュームポンプ５１の方へ行かないよう、ある程度溜れば排出して再利用できるよう設けられている。

【００２３】以上、軸受装置のオイル注入方法について種々の実施例を説明したが、それら単独またはこれらの組み合わせを用いていろいろな実施が可能である。

【００２４】

【発明の効果】本発明の軸受装置のオイル注入方法は、上述の如くで行なうため、次のような効果をそうする。即ち本発明の注入方法によれば、シャフトとスリーブとの間にオイルが介在されうる対応部位を除いたシャフトとスリーブとの表面へ、流体潤滑剤の付着を防止する被覆部材を予め塗布し、次にシャフトとスリーブとをオイル中に浸漬して、シャフトとスリーブとの間にオイルを介在させ、更にこの被覆部材を除去するようにした。従ってオイルが付着してはいけない部位に被覆部材を塗布し、オイル注入後はこれを除去するだけでよいので、オイル注入作業が簡単となり、軸受装置の大きさに係わらず、しかも確実に注入することができる。

【００２５】また被覆部材には可撓性部材を用いることにより、塗布作業が容易であり、オイル注入後の除去、即ち剥離作業がより一層簡単となり、作業効率の向上を図ることができる。

【００２６】更に本発明における別の軸受装置の流体潤滑剤注入方法によれば、シャフトとスリーブとの間隙に連設された減圧手段とにより、流体潤滑剤が注入されるようにした。これにより、流体潤滑剤の注入が容易であり、軸受装置の大きさに係わらず、しかも確実に注入することができる。

【図面の簡単な説明】

【図１】本発明の第一の実施例に係る軸受装置の断面図である。

【図２】本発明の第一の実施例に係る軸受装置の断面図である。

【図３】本発明の第一の実施例に係る軸受装置の断面図である。

【図４】本発明の第一の実施例に係る軸受装置の断面図である。

【図５】本発明の軸受装置が組み込まれるスピンドルモータの全体断面図である。

【図６】本発明の第二の実施例に係る軸受装置を示し、うち（ａ）はその側面図、（ｂ）は（ａ）の断面図、（ｃ）は断面図である。

【図７】本発明の第三の実施例に係る軸受装置及びその

7

注入装置を示した全体断面図である。

【符号の説明】

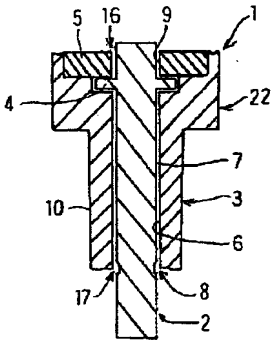
１，３１　軸受装置
２，３２　シャフト
３，３３　スリーブ

8

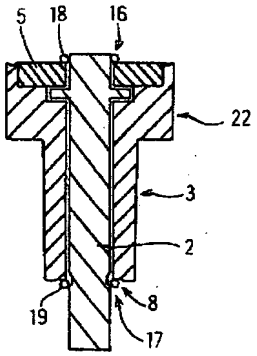
＊４　スラストプレート
５　スラストカバー
８，５０　軸受間隙
１８、１９　Ｏリング

＊

【図１】



【図２】



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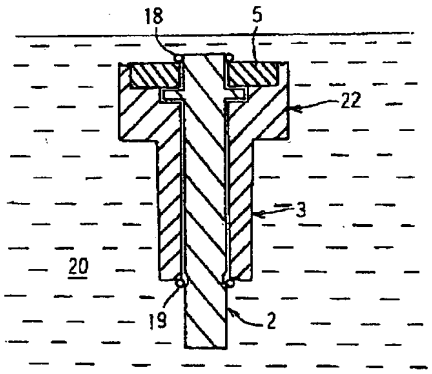

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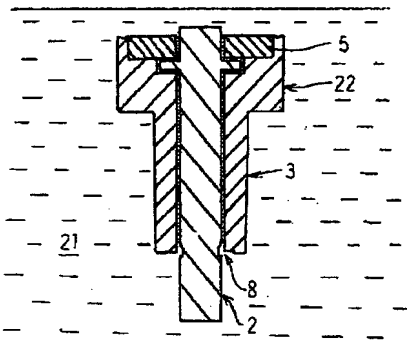

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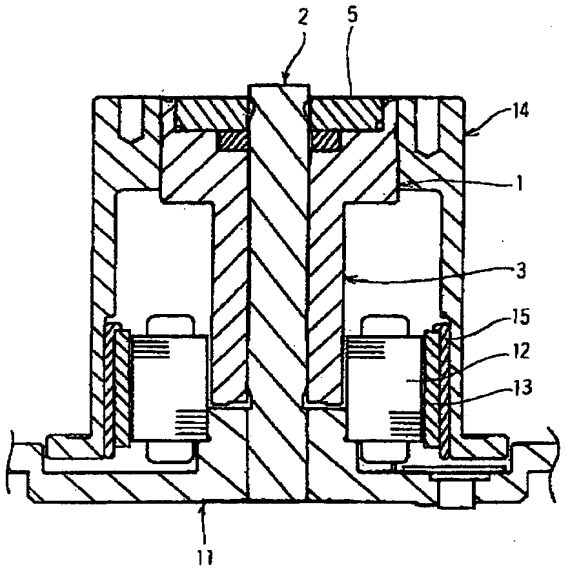

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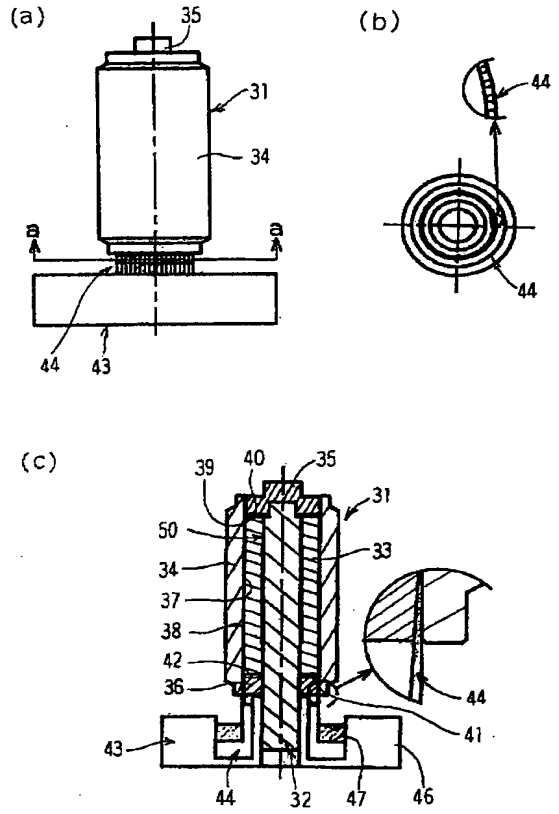
(a)
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(b)
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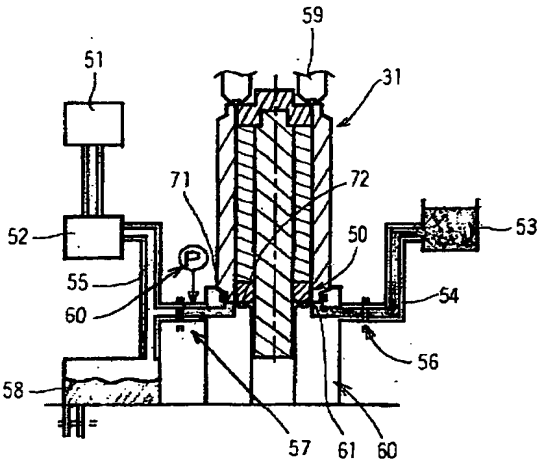
【図７】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(51) [International Patent Classification (6th Edition)]

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* NOTICES *

Epitome

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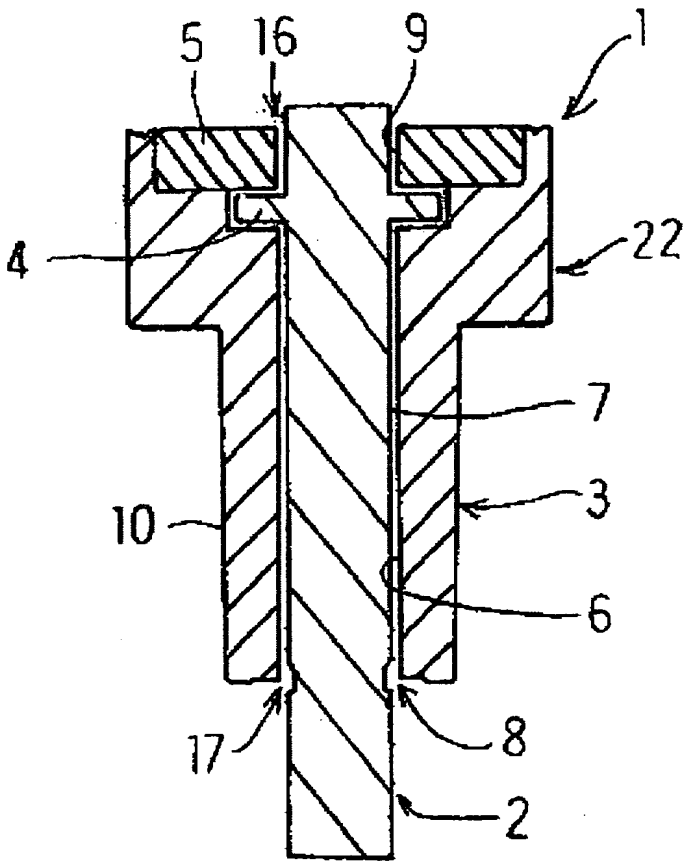
(57) [Abstract] (******)
[Objects of the Invention] Impregnation of a fluid lubrication agent can be efficiently performed also to the miniaturization of bearing equipment, and by the easy approach, time and effort is not taken, either but it pours in certainly. The fluid lubrication agent impregnation approach of the bearing equipment which can pour in a fluid lubrication agent efficiently also to the miniaturization of bearing equipment, cannot take time and effort but can moreover be certainly poured in by the easy approach is offered.
[Elements of the Invention] It is the impregnation approach of pouring in oil to the bearing equipment 1 with which relative rotation support of a shaft 2 and the sleeve 3 is carried out through oil. Apply beforehand the covering member which prevents oil adhesion to the front face of the shaft and sleeve except the correspondence part in which oil intervenes between a shaft 2 and a sleeve 3, and it deals, then, a shaft and a sleeve are immersed into oil, oil is made to intervene between a shaft and a sleeve, and a covering member is removed further.

[Translation done.]



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CLAIMS

[Claim(s)]
[Claim 1] As opposed to the bearing equipment with which relative rotation support of a shaft and the sleeve is carried out through a fluid lubrication agent To the front

face of said shaft except the correspondence part in which is the impregnation approach of pouring in said fluid lubrication agent, and said fluid lubrication agent intervenes between said shafts and said sleeves, and it deals, and said sleeve Apply beforehand the covering member which prevents adhesion of said fluid lubrication agent, and then said shaft and said sleeve are immersed into said fluid lubrication agent. The fluid lubrication agent impregnation approach of the bearing equipment characterized by what this fluid lubrication agent is made to intervene between said shafts and said sleeves, and said covering member was further removed for.
[Claim 2] The fluid lubrication agent impregnation approach according to claim 1 that the flexible material was used for said covering member.
[Claim 3] The fluid lubrication agent impregnation approach of the bearing equipment characterized by what said fluid lubrication agent is poured in for with the reduced pressure means which is the impregnation approach of pouring in said fluid lubrication agent, and were formed successively by the gap of said shaft and said sleeve to the bearing equipment with which relative rotation support of a shaft and the sleeve is carried out through a fluid lubrication agent.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the impregnation approach for pouring in the fluid lubrication agent about the bearing equipment which used the fluid lubrication agent.
[0002]
[Description of the Prior Art] There is a hydrodynamic bearing which was equipped with the shaft and the sleeve attached outside by this shaft, and both equipped with the sleeve bearing and dynamic pressure generating slot for example, by the porosity sintered alloy through lubrication oil as bearing equipment by which relative rotation

support is carried out. Although the oil for lubrication is intervened and prepared in the gap (bearing) section of a shaft and a sleeve with these bearing equipments, when pouring in oil to such bearing equipment, there are an approach of using and pouring an oil dispenser into the gap section of a shaft and a sleeve, an approach which is immersed in an oil tub in every bearing equipment of a shaft and a sleeve, and is filled up with oil.

[0003]

[Problem(s) to be Solved by the Invention] By the oil impregnation approach using an oil dispenser, while a limitation is in the dimension which can respond as the bearing equipment poured in is miniaturized, since regurgitation opening of a dispenser is specified corresponding to the gap (bearing) dimension of a shaft and a sleeve, an oil injection rate turns into a minute amount, and the control becomes difficult. On the other hand, it was immersed in the oil tub in every bearing equipment of a shaft and a sleeve, and by the approach this (bearing) pours in oil into a gap, it becomes large-scale to furnish the oil tub itself, and also oil adhered also to the part which I do not want to adhere originally in bearing equipment, and the removal for it has taken time and effort. Beforehand, although it was also possible to have applied an oil-repellent **** oil repellent agent for oil in that case, the removal itself is complicated and a certain policy was desired to such oil impregnation.

[0004] The place which this invention is performed to the above troubles which consisted in the conventional technique, and is made into the technical problem is to offer the fluid lubrication agent impregnation approach of the bearing equipment which can pour in a fluid lubrication agent efficiently also to the miniaturization of bearing equipment, cannot take time and effort but can moreover be certainly poured in by the easy approach.

[0005]

[Means for Solving the Problem] As opposed to the bearing equipment with which, as for this invention, relative rotation support of a shaft and the sleeve is carried out through a fluid lubrication agent in order to attain the above-mentioned technical problem To the front face of said shaft except the correspondence part in which is the impregnation approach of pouring in said fluid lubrication agent, and said fluid lubrication agent intervenes between the; aforementioned shaft and said sleeve, and it deals, and said sleeve Apply beforehand the covering member which prevents adhesion of said fluid lubrication agent,;, next said shaft and said sleeve are immersed into said fluid lubrication agent, this fluid lubrication agent is made to intervene between said shafts and said sleeves, and; and also said covering member were removed.

[0006] Moreover, it is desirable to use a flexible material for said covering member.

[0007] Furthermore, according to this invention, said fluid lubrication agent was made to be poured in by the reduced pressure means which is the impregnation approach of pouring in said fluid lubrication agent, and were formed successively by the gap of the; aforementioned shaft and said sleeve to the bearing equipment with which relative rotation support of a shaft and the sleeve is carried out through a fluid

lubrication agent.
[0008]
[Function] According to the fluid lubrication agent impregnation approach of the bearing equipment of this invention, to the front face of the shaft and sleeve except the correspondence part in which a fluid lubrication agent intervenes between a shaft and a sleeve, and it deals Apply beforehand the covering member which prevents adhesion of a fluid lubrication agent, then, said shaft and said sleeve are immersed into said fluid lubrication agent, this fluid lubrication agent is made to intervene between said shafts and said sleeves, and said covering member was removed further. Therefore, since a covering member is applied to the part to which a fluid lubrication agent must not adhere and after fluid lubrication agent impregnation should just remove this, a fluid lubrication agent impregnation activity becomes easy, and, moreover, it can pour in certainly irrespective of the magnitude of bearing equipment.
[0009] Moreover, by using a flexible material for a covering member, spreading is easy, it becomes easy [the removal i.e., the exfoliation, after fluid lubrication agent impregnation] much more [it], and improvement in working efficiency can be aimed at.
[0010] Furthermore, according to the fluid lubrication agent impregnation approach of another bearing equipment in this invention, the fluid lubrication agent was made to be poured in by the reduced pressure means formed successively by the gap of a shaft and a sleeve. Thereby, impregnation of a fluid lubrication agent is easy and, moreover, it can pour in certainly irrespective of the magnitude of bearing equipment.
[0011]
[Example] The example of the fluid lubrication agent impregnation approach of bearing equipment of following this invention is explained in full detail with reference to the following drawings. The bearing equipment shown in drawing 1 is incorporated and used for the spindle motor shown in drawing 5 . Bearing equipment 1 consists of a shaft 2 and a sleeve 3 attached outside this. the collar prepared in the upper limit section of a shaft 2 by ******ing annularly -- the thrust plate 4 of a ** is formed, and the thrust covering 5 is formed so that a thrust plate 4 may be inserted into shaft orientations. The periphery section 7 of a shaft 2 and the inner circumference section 6 of a sleeve 3 have a minute gap in the direction of a radial (radius), opposite arrangement is carried out and opposite arrangement of them is carried out with the minute gap on both sides of the thrust plate 4 in the thrust (shaft) direction with a sleeve 3 and the thrust covering 5. Furthermore, opposite arrangement of the inner circumference section 9 of the thrust covering 5 and the periphery section 7 of a shaft 2 is carried out with the minute gap to the radial direction. (Removing the minute gap to the radial direction in the thrust covering 5) The minute gap 8 of these radials and the thrust direction is filled up with a fluid lubrication agent, and the dynamic pressure generating slot which carries out hydrodynamic bearing support through a fluid lubrication agent is formed in it at the

member [one of] side which moreover counters, respectively.
[0012] In addition, the bottom edge of a shaft 1 is inserted in housing (or bracket) 11, and the spindle motor with which such bearing equipment 1 is incorporated is fixed, as shown in drawing 5 . A rotor hub 14 attaches outside the up periphery the sleeve 3 by which rotation support is carried out, and it is fixed to a shaft 1. Moreover, the stator 12 which is a rotation driving member is fixed to the boss section of housing 11, and the Rota magnet 13 is arranged in the rotor hub 14 side so that it may counter to radial [this / stator 12 and radial]. The Rota magnet 13 is attached in the rotor hub inner circumference section through Rota York 15. Therefore, if a necessary electrical signal energizes to a stator 12, the rotation drive of the rotor hub 14 will be carried out by the electromagnetic interaction of a stator 12 and the Rota magnet 13.
[0013] Bearing support is carried out through a fluid lubrication agent, and bearing equipment 1 explains below the procedure of pouring in oil by the fluid lubrication agent used as the basis of the engine performance of bearing equipment 1, i.e., the fluid lubrication agent by which it is placed between the bearing gaps 8. In bearing equipment 1, it explains to drawing 1 already shown first using drawing 1 thru/or drawing 4 . As shown in drawing 1 , beforehand, fitting of a shaft 2 and the sleeve 3 is carried out, and it constructs, and further, thrust covering is fixed to a sleeve 3 and the whole bearing equipment is formed. Next, as shown in drawing 2 , the opening both ends 16 and 17 of the bearing gap 8 are equipped with the elastic rings (for example, O character-like rubber ring) 18 and 19, and the double door openings 16 and 17 are blockaded. That is, the bearing gap 8 of bearing equipment 1 is closed with the exterior.
[0014] As the bearing equipment 1 with which the closure of the bearing gap 8 was carried out is shown in drawing 3 , it is immersed into the melting basin 20 to which melting of the vinyl acetate was carried out. Thereby, vinyl acetate adheres over the surface section whole region of bearing equipment 1. In addition, since the bearing gap 8 is equipped with the elastic rings 18 and 19, vinyl acetate does not trespass upon the interior. It is immersed in the elastic rings 18 and 19 by the bearing equipment 1 which was able to be pulled up from the tub 20 to the oil depot 21 which is the fluid lubrication agent of drawing 5 which it is removed from the bearing gap 8 and shown below. Thereby, oil permeates the bearing gap 8 interior and is poured in. In addition, since the gap of the bearing gap 8 is minute, while making oil permeate the interior in capillarity, the oil depot 21 whole can be decompressed and oil can also be made to pour in compulsorily.
[0015] In this way, after the bearing gap 8 of bearing equipment 1 is filled up with oil, the vinyl acetate adhering to a bearing device table side is removed and removed. Thereby, the oil adhering to the front face of bearing equipment 1 is removed easily. Therefore, since oil has not adhered to the excessive part of bearing equipment in case it is included in a spindle motor as shows this bearing equipment 1 to drawing 5 , polluting the interior of a spindle motor with oil, or oil invading into an assembly fixed part and causing poor attachment is prevented.
[0016] After spreading is easy to exfoliate and vinyl acetate can aim at improvement

in workability while it is easy to apply to bearing equipment 1. It is possible even if it covers and coats bearing equipment 1 with spray painting in the above-mentioned example, although immersed to the melting basin 20 of vinyl acetate. In addition, it is also possible to use flexible materials, such as others, for example, natural rubber latex, a vinyl chloride, etc., and a desirable result is obtained in the point of a film strength or detachability. [vinyl acetate] And although the bearing equipment 1 of the example of drawing uses hydrodynamic bearing equipment, it can apply the various oil of the sleeve bearing by the porous sintered alloy, or others to the bearing equipment which intervened. Moreover, in addition to the shaft 2 and the sleeve 3, the bearing equipment of the example of drawing shows the configuration in which the thrust covering 5 and a thrust plate 4 were formed, but even if it is the configuration of a shaft and a sleeve, and combination, of course, it is not cared about. Furthermore, it can replace with the elastic rings 18 and 19 which close the bearing gap 8 of bearing equipment 1, for example, a ring-like fitting member etc. can be adopted.

[0017] Drawing 6 shown below shows another bearing equipment, and is a top view [in / (a) of drawing 6 , and / in (b) / view a-a of (a)], and the (c) sectional view. [the side elevation] The bearing equipment 31 of drawing 6 shows the condition of being laid in the impregnation base 43 for each pouring in oil. The thrust members 35 and 36 are being fixed to the shaft 32 so that a sleeve 33 may be attached outside by the shaft 32 and bearing equipment 31 may sandwich the sleeve vertical edge (both ends) section. The thrust members 35 and 36 have a minute gap for the both ends of a sleeve 32 to shaft orientations, and opposite arrangement is carried out. Sheathing of the cylinder-like case 34 is carried out to the outside of a sleeve 32. The bearing gap 50 is generated by the radial direction minute gap of the periphery section of a shaft 32, and the inner circumference section of a sleeve 33 and the thrust direction minute gap by the thrust members 35 and 36 by which opposite arrangement was carried out in the thrust direction at a sleeve 33 and this, and these minute gaps, and the oil which is a fluid lubrication agent is filled up with and poured in.

[0018] Next, the procedure of pouring oil into bearing equipment 31 is explained. As shown in the impregnation base 43 in which bearing equipment 31 is laid at drawing 6 (b) and (c), it has the probe 44 with which it was annularly arranged and much minute projections were prepared in the hoop direction by turns. A probe 44 is made to associate corresponding to the bottom thrust member 36 of bearing equipment 31, and is formed. The slot 47 where oil was stored is established in the probe periphery side in the impregnation base 43. Therefore, when bearing equipment 31 is laid in the impregnation base 43, the oil of a slot 47 permeates a probe 44 and is poured in by capillarity in the bearing gap 50. In this case, oil is poured in into the bearing gap 50 until it reaches at the equilibrium point of the internal holding power which is going to hold oil with the surface tension generated in the bearing gap 50, and the osmosis suction force by capillarity. In addition, if the whole equipment is put into reduced pressure (vessel) equipment in this case and it carries out in a reduced

pressure ambient atmosphere, since the residual air bubbles contained in oil are removable, it is more desirable.

[0019] Drawing 7 shown below explains the procedure of still more nearly another oil impregnation, and the same number is given to bearing equipment in the same part as what was shown in drawing 6 . In drawing 7 , oil is poured in to bearing equipment 31 using a decompression device, and it explains below. The bearing equipment 31 which this procedure is a vacuum permutation method using reduced pressure, and was laid in the impregnation base 60 is arranged in the bottom opening 61 of the bearing gap 50 where oil is poured in corresponding to the oil introduction section of the impregnation base 60. Moreover, the bearing equipment 31 bottom is prepared so that top opening of the bearing gap 50 may be blockaded, while being pressed by the clamp member 59.

[0020] The depot 53 with which oil was stored is formed in the impregnation base 60, and it connects with the bottom opening 61 of bearing equipment 31 through the supply path 54 and the bulb 56. (Right-hand side of drawing) In the impregnation base 60, the vacuum pump 51 is independently connected to the bottom opening 61 through the chamber 52, the aeration way 55, and the bulb 57 again. (Left-hand side of drawing) Further, it forms successively to the bottom opening 61 and the oil discharge tub 58 is formed in the impregnation base 60.

[0021] Next, the procedure of pouring oil into the bearing equipment 31 of drawing 7 is explained. It changes into the condition of having closed bulbs 56 and 57 first, and bearing equipment 31 is laid in the impregnation base 60. The installation part of the impregnation base 60 is connected corresponding to the bottom opening 61 of bearing equipment 31 in that case. (The seal auxiliary members 71 and 72, such as an elastic ring, are infixed in the installation corresponding point of the impregnation base 60 so that sealed connection may be made in addition.) And the clamp member 59 descends from the upper part of drawing, and bearing equipment 31 is pressed. The set of bearing equipment 31 is completed now.

[0022] A bulb 57 can open after bearing equipment 31 completion, and the bearing gap 50 is decompressed. A bulb 57 is closed after reduced pressure. Next, a bulb 56 can open and oil is drawn in the bearing gap 50 through the supply way 54 from a depot 53. A bulb 56 is closed after restoration impregnation of the oil is carried out in the rear bearing gap 50 of predetermined time. Oil impregnation is completed now. The clamp member 59 goes up after that, and it is removed, and is exchanged for new bearing equipment 31. If it collects to some extent so that excessive oil may be stored and it may not go to the direction of a vacuum pump 51, it is prepared in the oil discharge tub 58 so that it can discharge and reuse.

[0023] As mentioned above, although various examples were explained about the oil impregnation approach of bearing equipment, various operations are possible using independent [these] or such combination.

[0024]

[Effect of the Invention] The oil impregnation approach of the bearing equipment of this invention is like ****, and the following effectiveness is done so in order to

carry out. That is, according to the impregnation approach of this invention, apply beforehand the covering member which prevents adhesion of a fluid lubrication agent to the front face of the shaft and sleeve except the correspondence part in which oil intervenes between a shaft and a sleeve and it deals, then, a shaft and a sleeve are immersed into oil, oil is made to intervene between a shaft and a sleeve, and this covering member was removed further. Therefore, since a covering member is applied to the part to which oil must not adhere and after oil impregnation should just remove this, an oil impregnation activity becomes easy and, moreover, it can pour in certainly irrespective of the magnitude of bearing equipment.
[0025] Moreover, by using a flexible member for a covering member, spreading is easy, it becomes easy [the removal i.e., the exfoliation, after oil impregnation] much more [it], and improvement in working efficiency can be aimed at.
[0026] Furthermore, according to the fluid lubrication agent impregnation approach of another bearing equipment in this invention, the fluid lubrication agent was made to be poured in by the reduced pressure means formed successively by the gap of a shaft and a sleeve. Thereby, impregnation of a fluid lubrication agent is easy and, moreover, it can pour in certainly irrespective of the magnitude of bearing equipment.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the sectional view of the bearing equipment concerning the first example of this invention.
[Drawing 2] It is the sectional view of the bearing equipment concerning the first example of this invention.
[Drawing 3] It is the sectional view of the bearing equipment concerning the first example of this invention.
[Drawing 4] It is the sectional view of the bearing equipment concerning the first

example of this invention.
[Drawing 5] It is the whole spindle motor sectional view where the bearing equipment of this invention is incorporated.
[Drawing 6] The bearing equipment concerning the second example of this invention is shown, and (a) is [the sectional view of (a) and (c of the side elevation and (b))] sectional views inside.
[Drawing 7] It is the whole sectional view having shown the bearing equipment concerning the third example of this invention, and its injector.
[Description of Notations]
1 31 Bearing equipment
2 32 Shaft
3 33 Sleeve
4 Thrust Plate
5 Thrust Covering
8 50 Bearing gap
18 19 O ring

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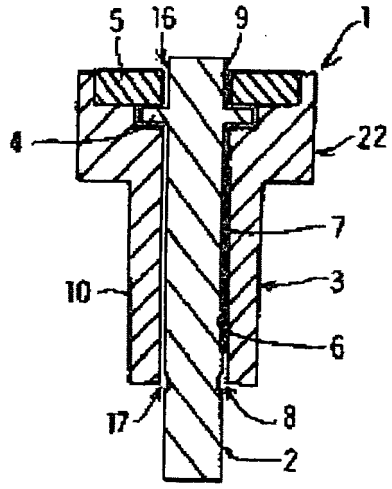
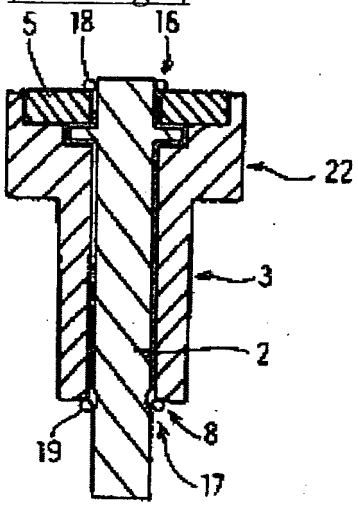
DRAWINGS

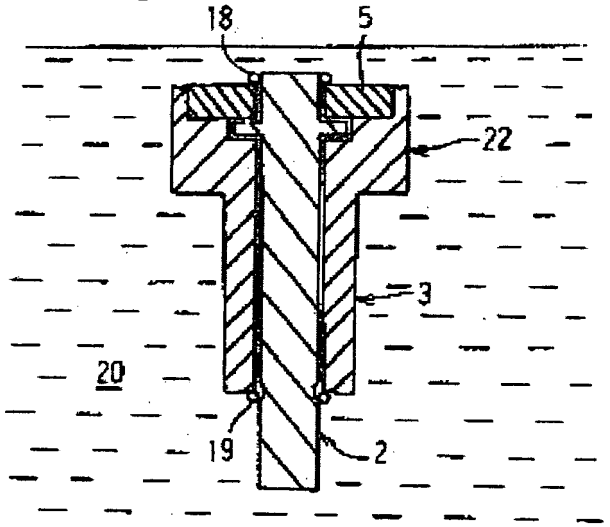
[Drawing 1]



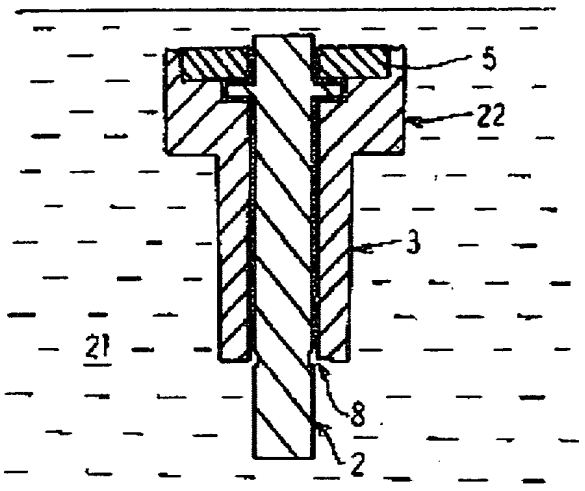
[Drawing 2]



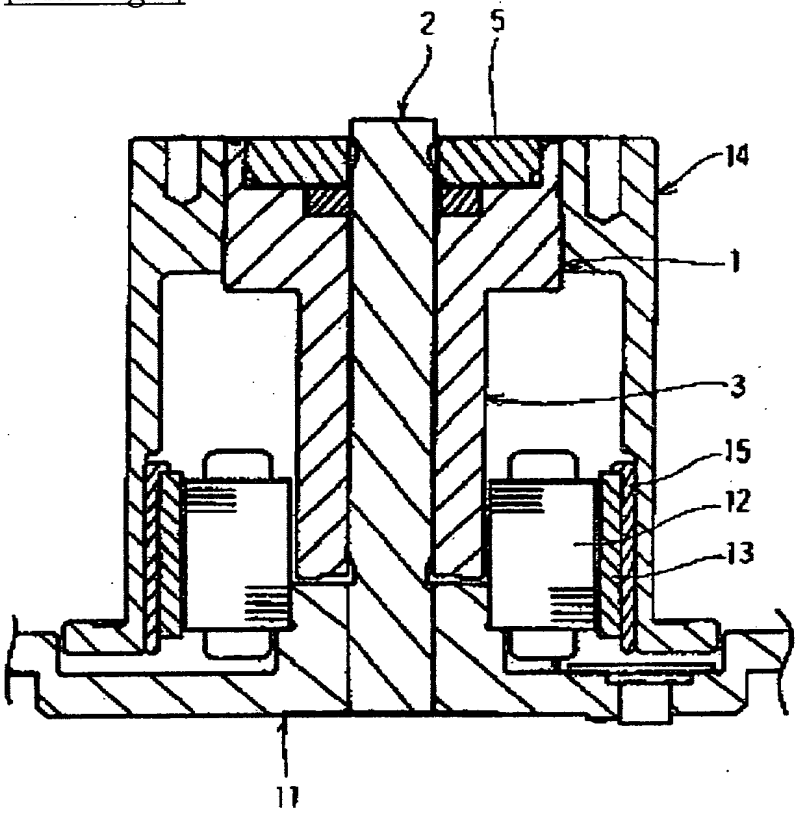
[Drawing 3]



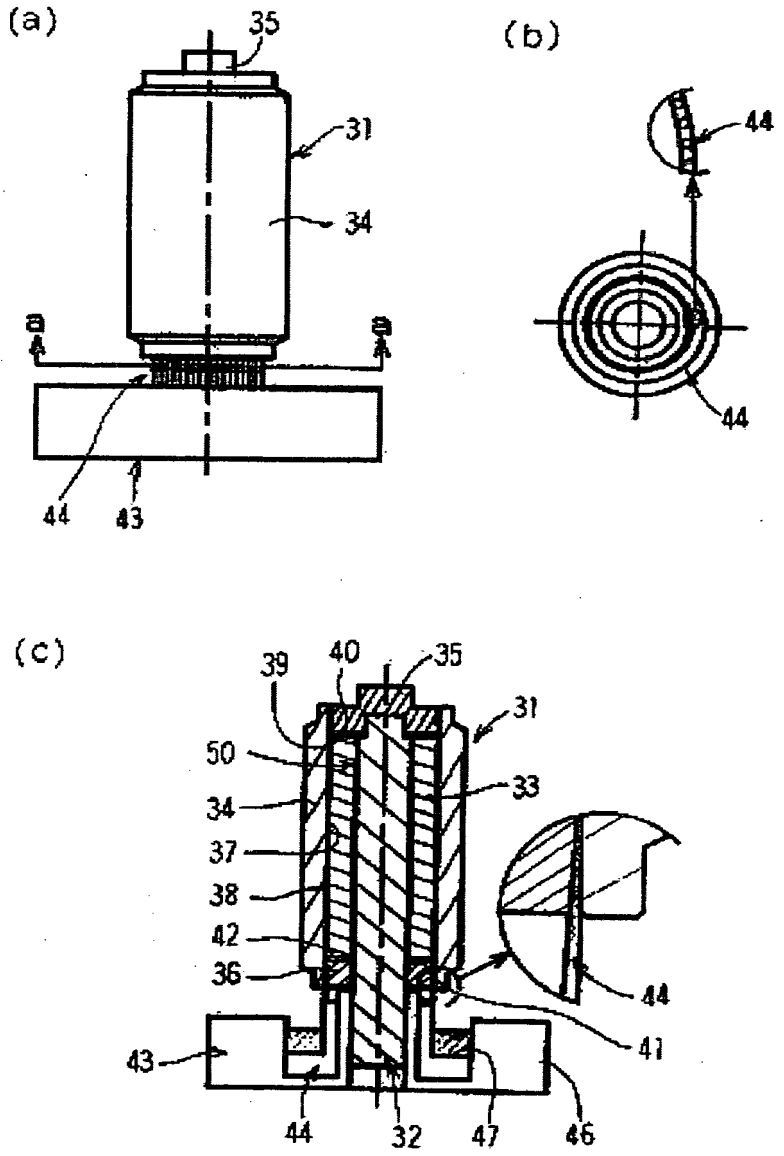
[Drawing 4]



[Drawing 5]



[Drawing 6]


(a)
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(c)
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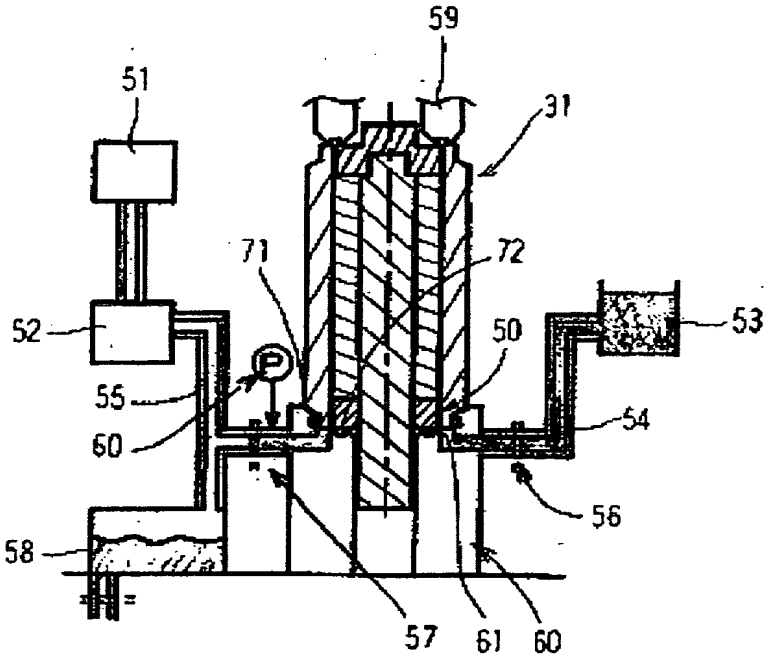
[Drawing 7]



[Translation done.]